Chlorophyll α Assessment

A General Overview

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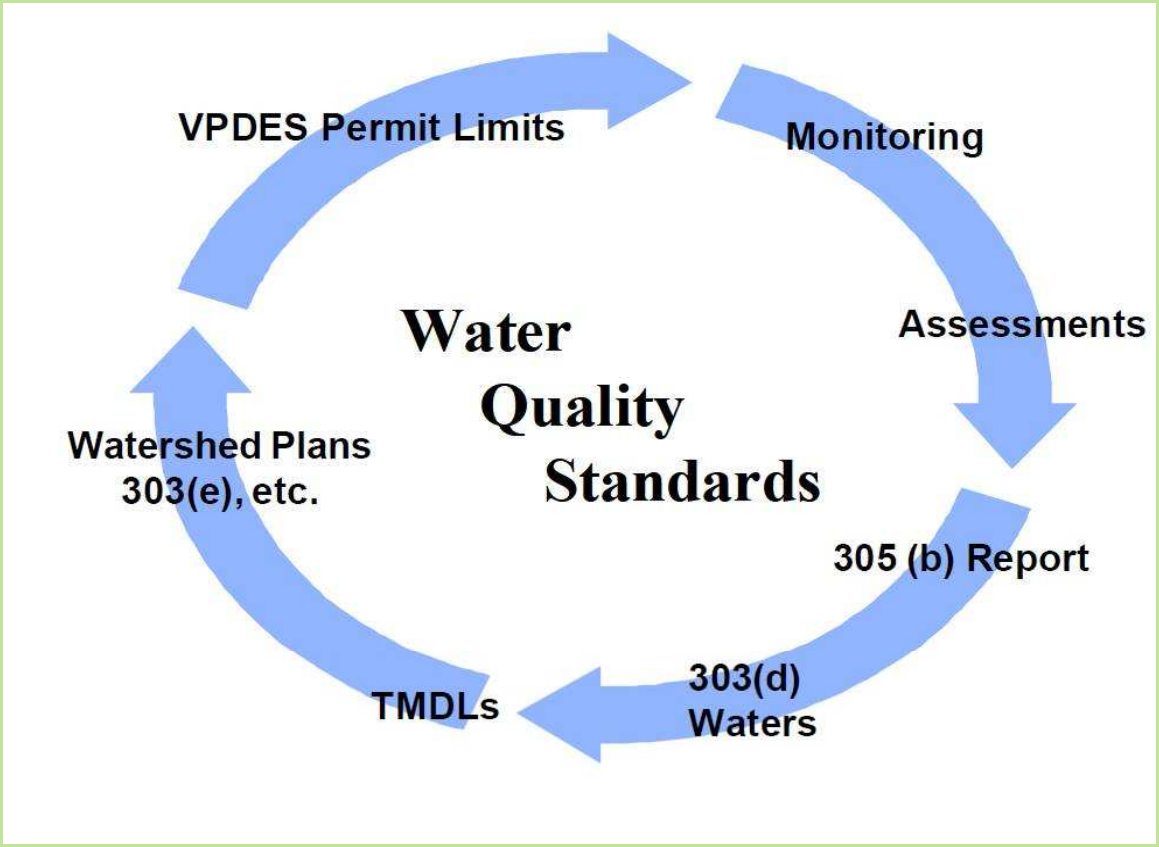
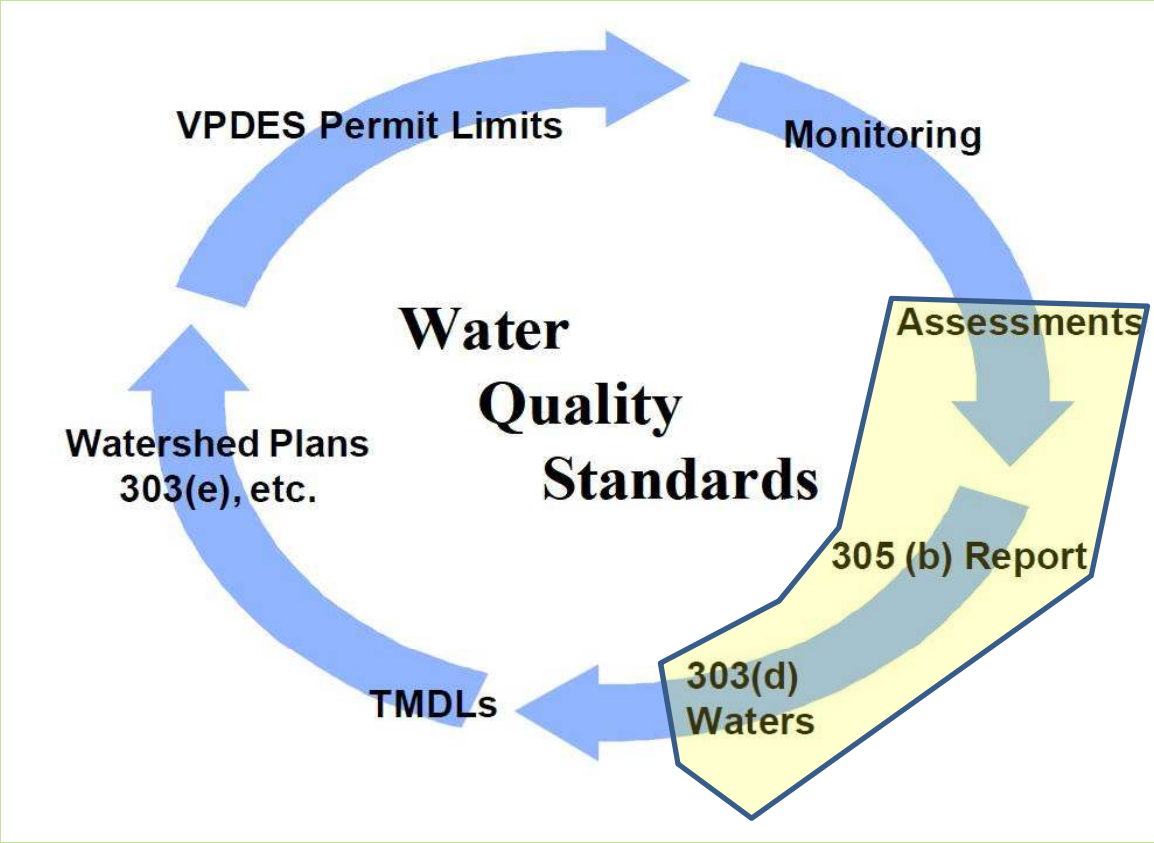
Water Quality Assessment Coordinator
Spring SAP meeting
April 11, 2014

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

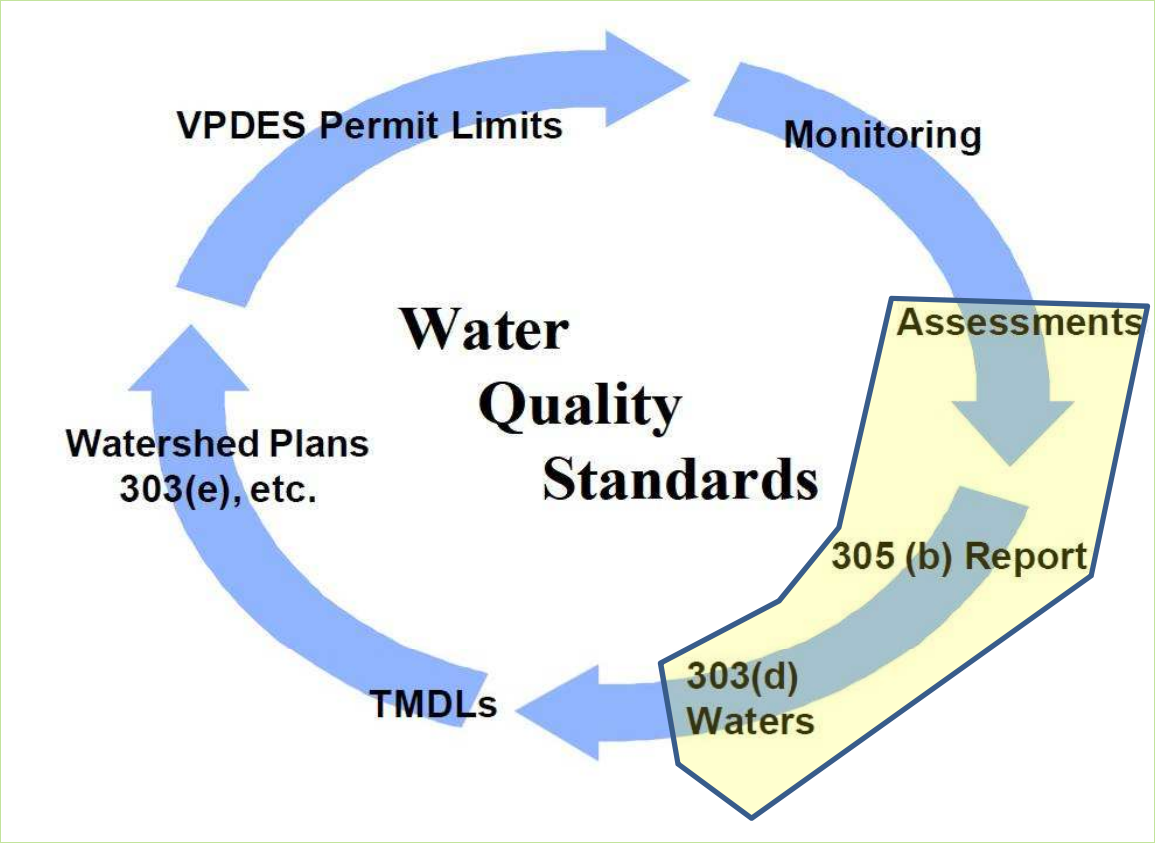

VPDES Permit Limits
Monitoring
Assessments
305 (b) Report
303(d)
Waters
TMDLs
Watershed Plans
303(e), etc.
Water
Quality
Standards



305(b) and 303(d) refer to sections of the Clean Water Act

-States must describe and characterize the quality of their navigable waters. (305)

-States must identify waters not meeting WQS and develop a TMDL to restore them. (303)



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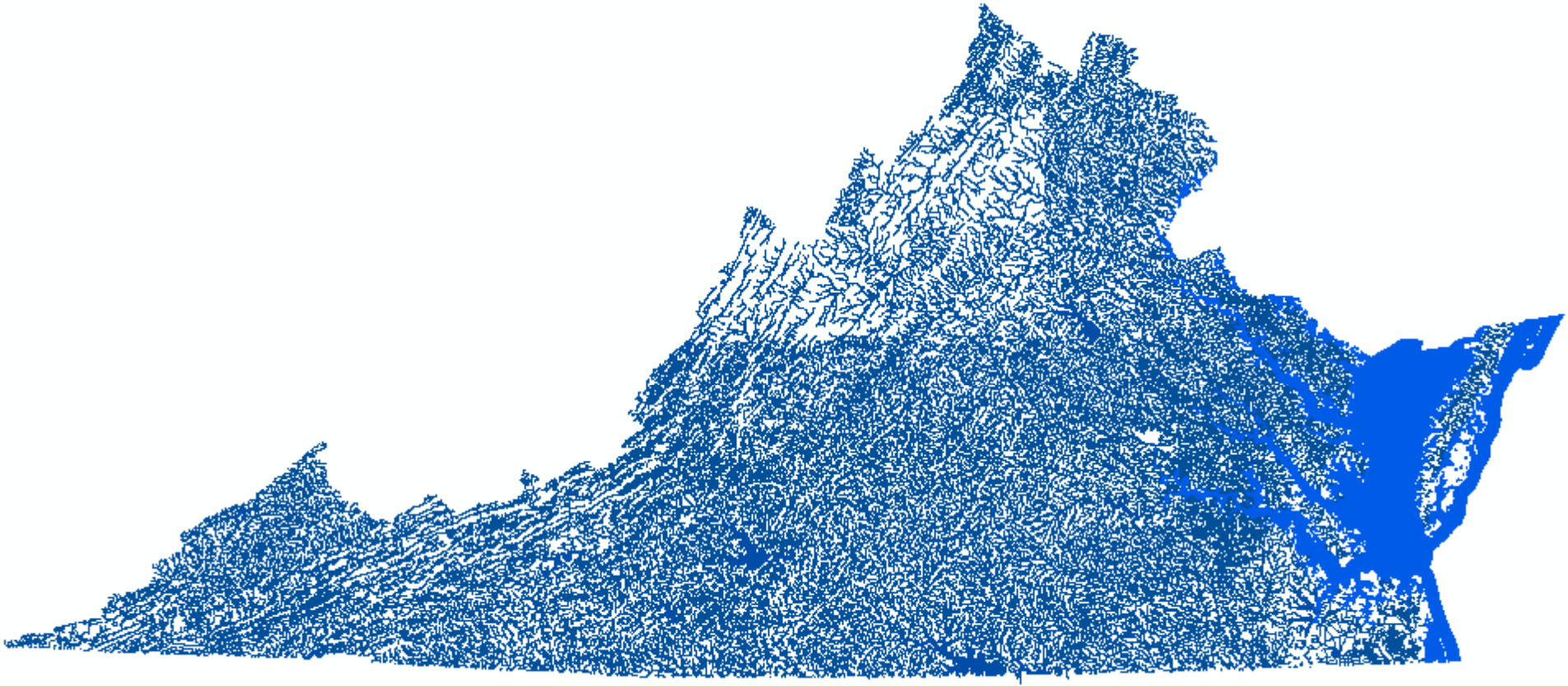
-States must describe and characterize the quality of their navigable waters. (305)

-States must identify waters not meeting WQS and develop a TMDL to restore them. (303)

The 305(b) and 303(d) tasks are performed every two years and presented in a document we call the "Integrated Report."

Virginia has a lot of water to assess!



The Commonwealth is ranked 15th in the nation for total water area (US Census, 2010)

CLASS	DESCRIPTION OF WATERS	DISSOLVED OXYGEN (mg/l)****		pH	Max. Temp. (°C)
		Min.	Daily Avg.		
I	Open Ocean	5.0	--	6.0-9.0	--
II	Estuarine Waters (Tidal Water-Coastal Zone to Fall Line)	4.0	5.0	6.0-9.0	--
III	Nontidal Waters (Coastal and Piedmont Zones)	4.0	5.0	6.0-9.0	32
IV	Mountainous Zones Waters	4.0	5.0	6.0-9.0	31
V	Stockable Trout Waters	5.0	6.0	6.0-9.0	21
VI	Natural Trout Waters	6.0	7.0	6.0-9.0	20
VII	Swamp Waters	*	*	3.7-8.0*	**

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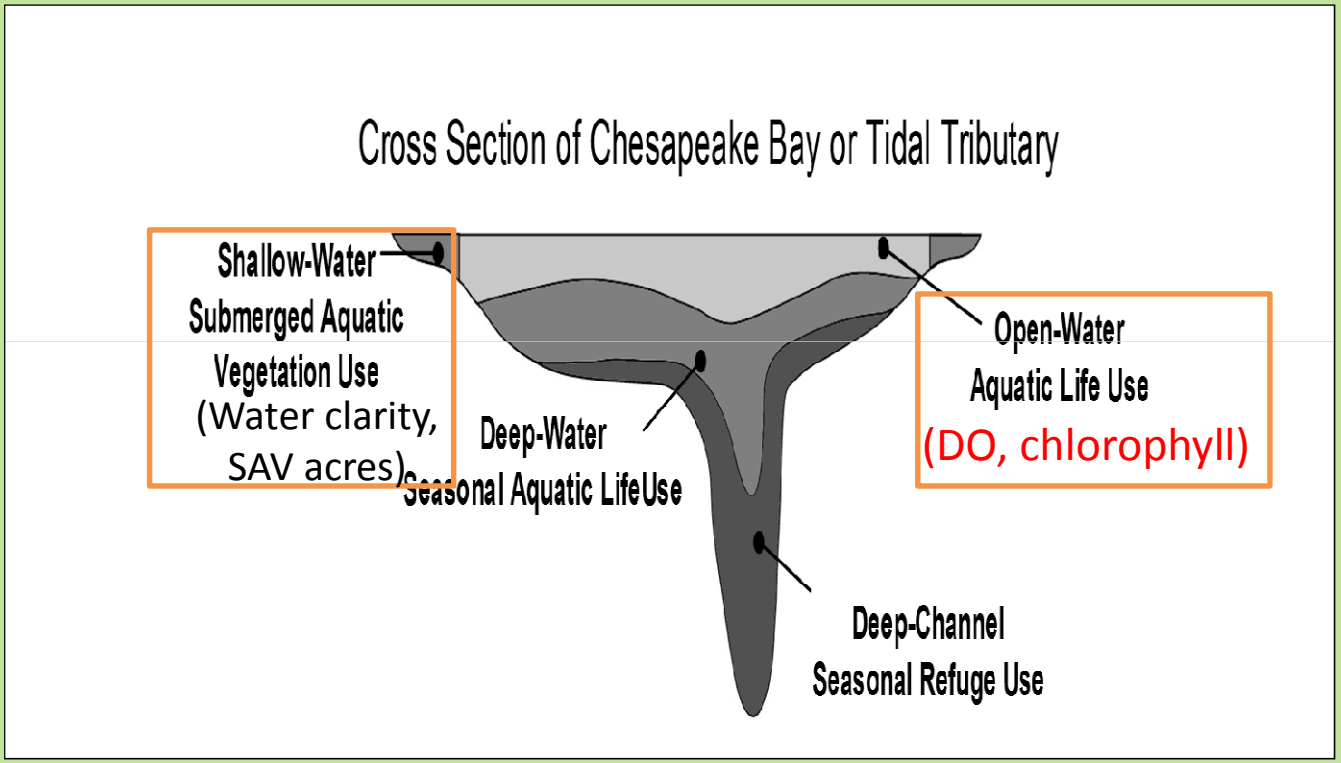
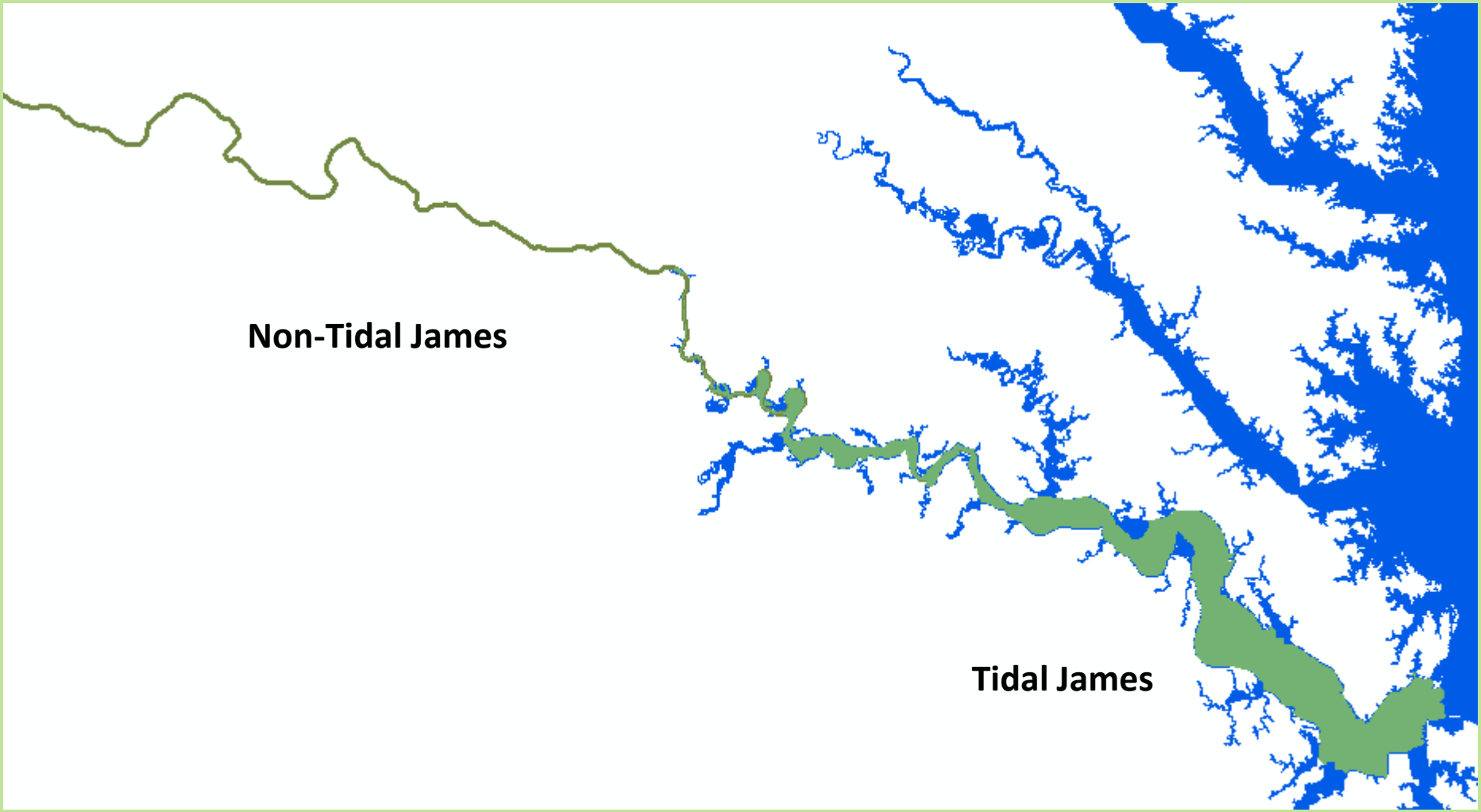
VII	Swamp Waters	*	*	3.7-8.0*	**
	Chesapeake Bay	**TOO COMPLICATED FOR THIS TABLE!**		**6.0-9.0**	**—**

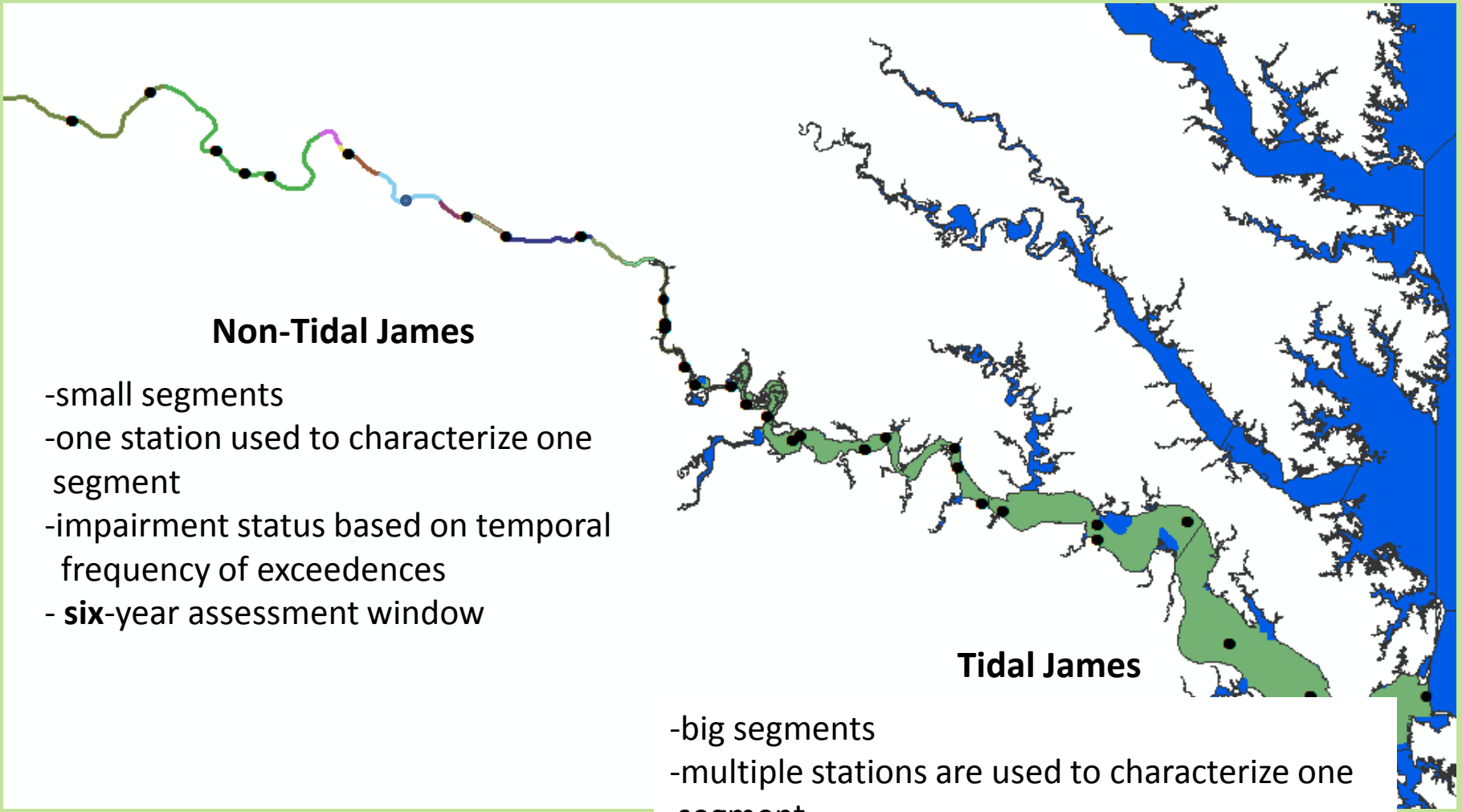
The Tidal James River is considered a “Bay Water”, which means it is assessed using special criteria designed to protect the aquatic life of the Chesapeake Bay.

Different aquatic life standards apply to the different "zones" of the Bay. The James River has two such zones—the Shallow Water SAV use and the Open Water use.




Non-Tidal James
Tidal James

The Bay waters not only have special standards, but they are also assessed differently.

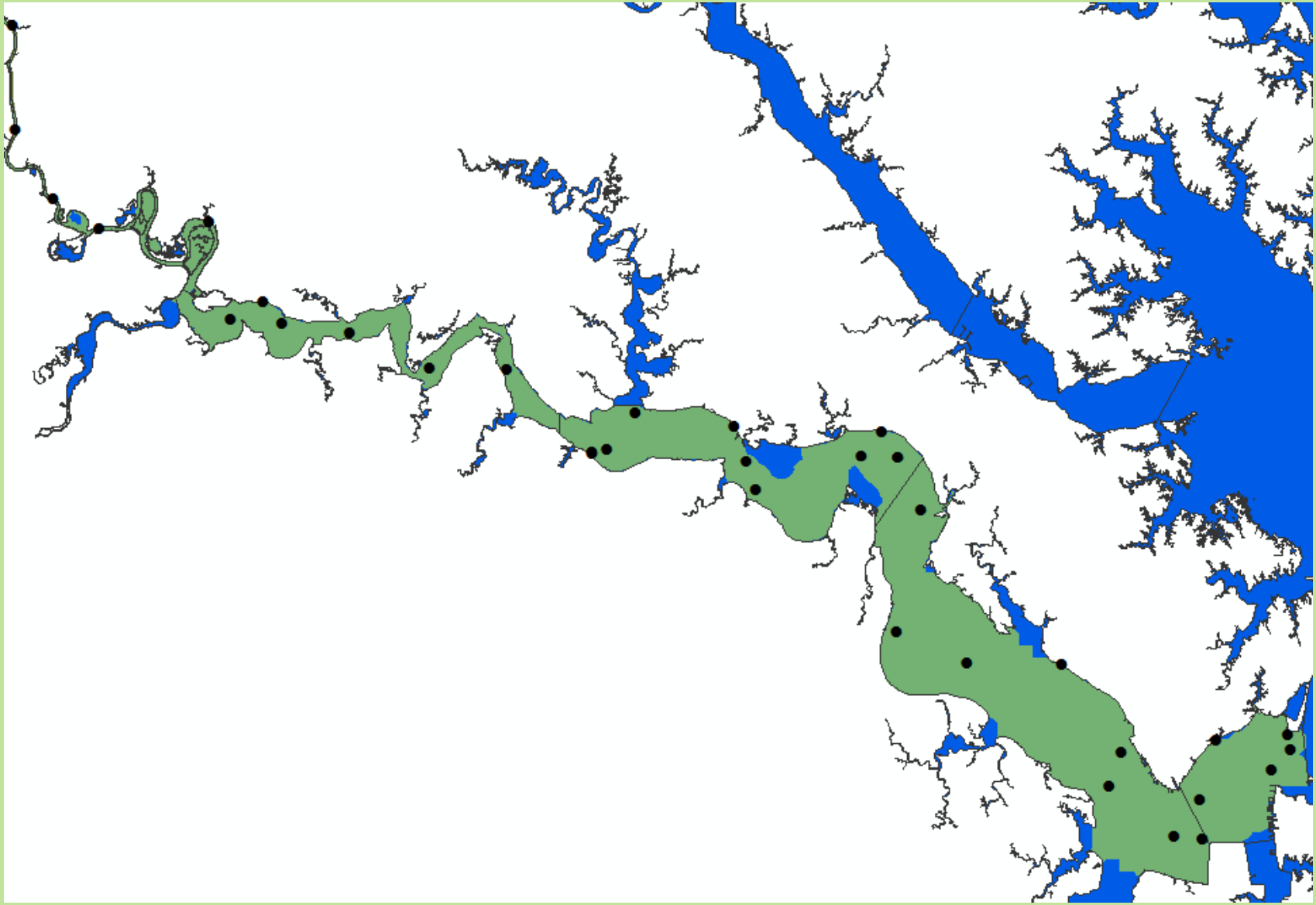


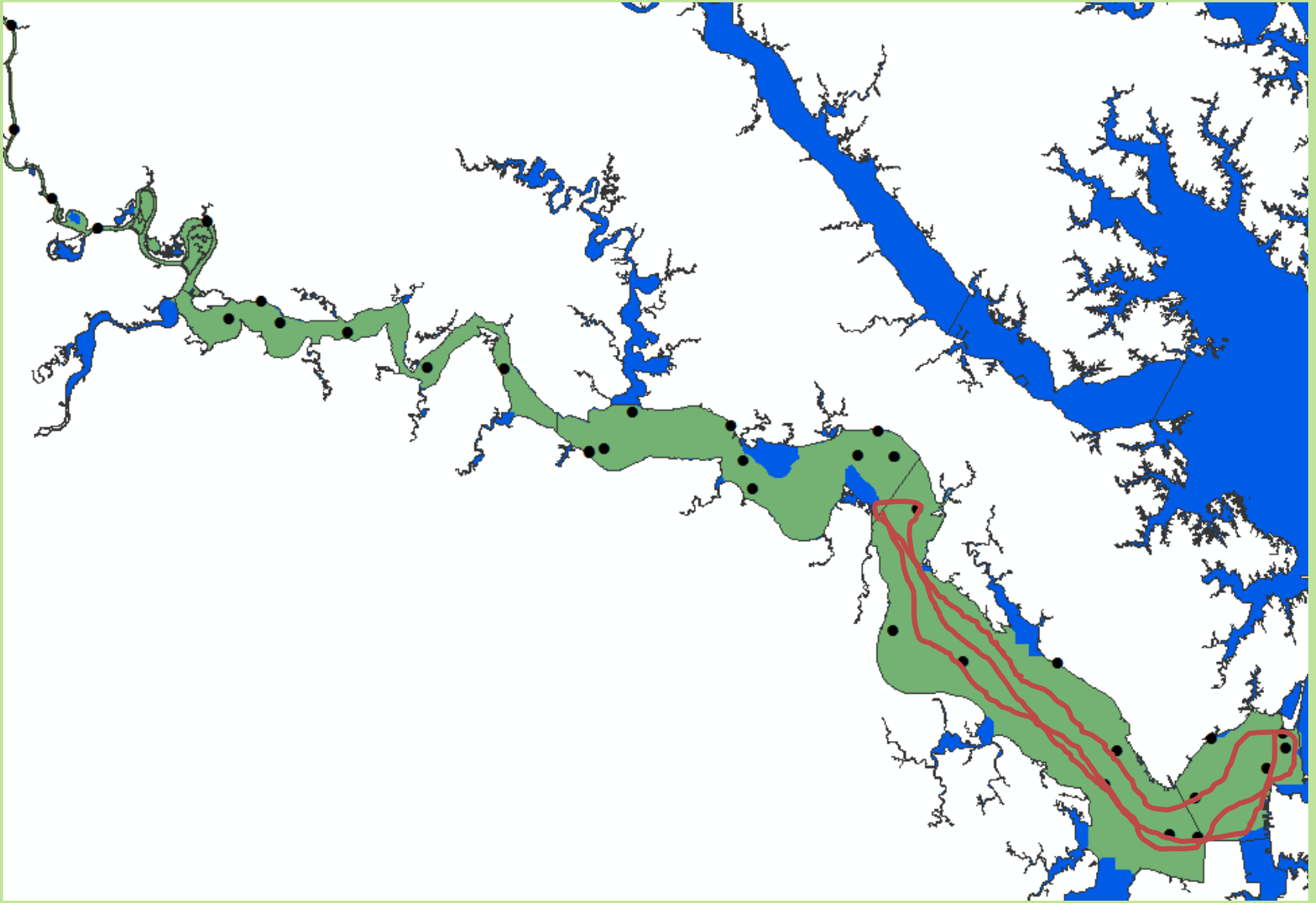
Non-Tidal James

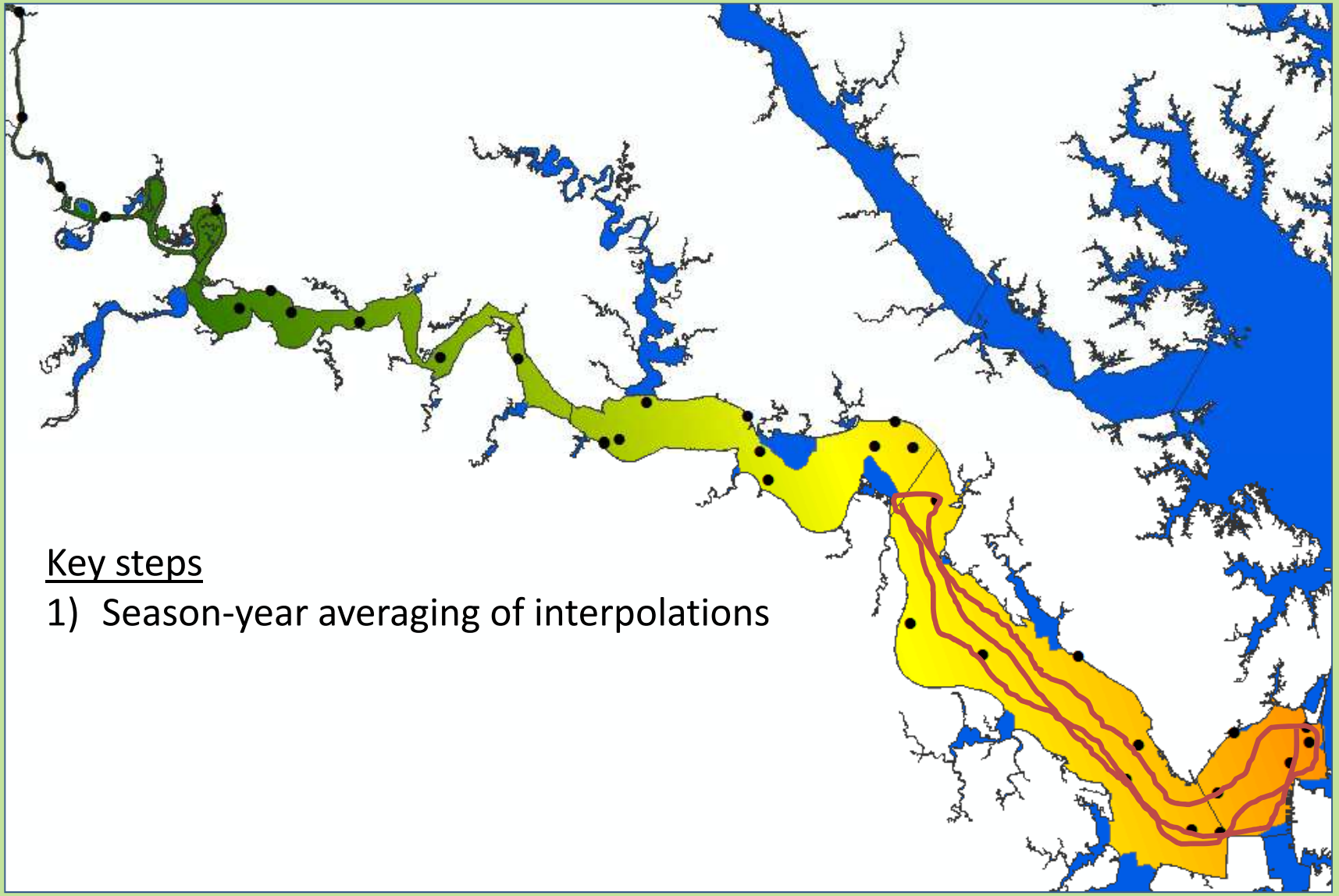
-small segments
-one station used to characterize one segment
-impairment status based on temporal frequency of exceedences
- **six**-year assessment window

Tidal James

-big segments
-multiple stations are used to characterize one segment
-impairment status based on **spatial + temporal** frequency of exceedences.
- **three**-year assessment window

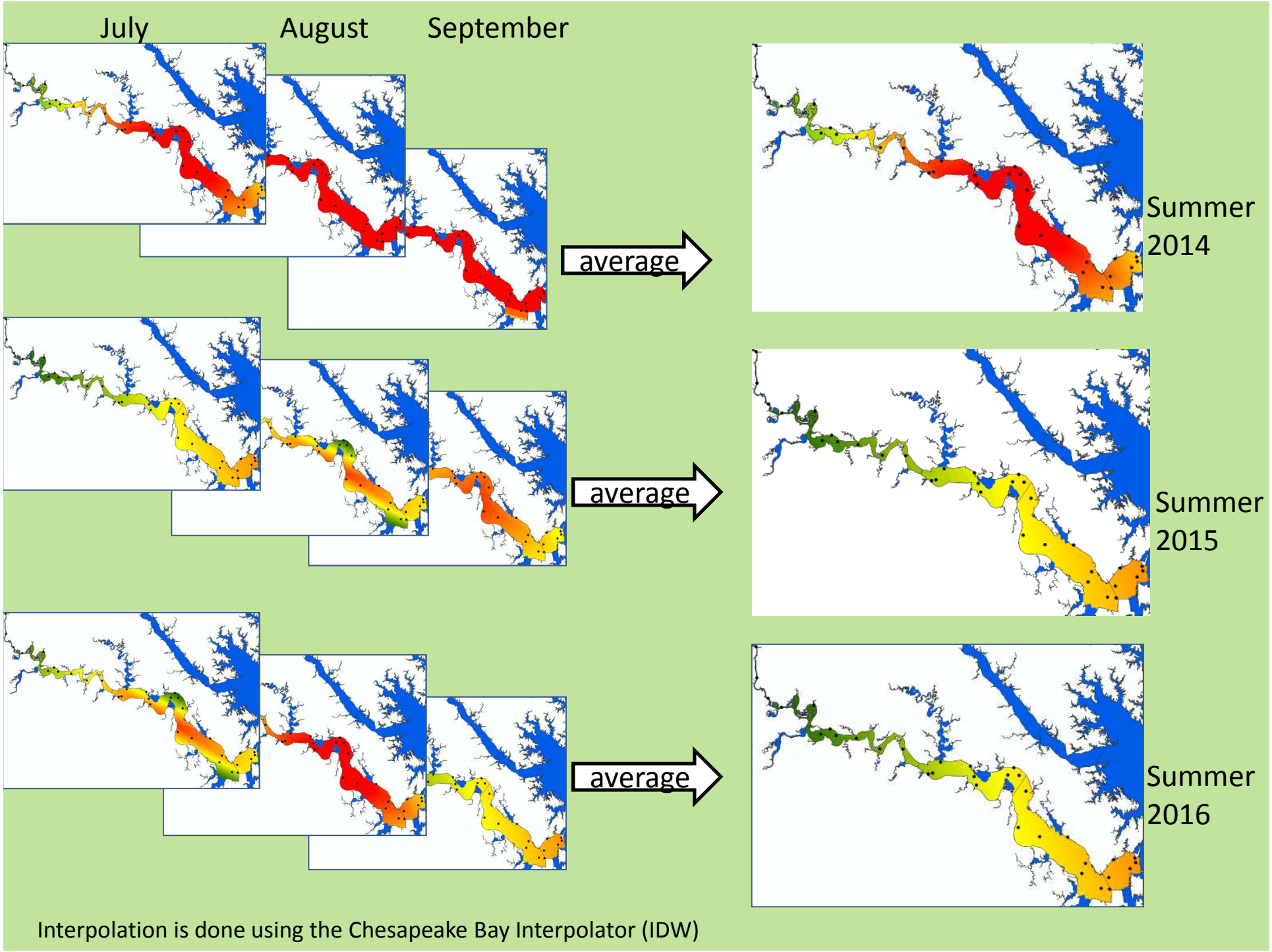




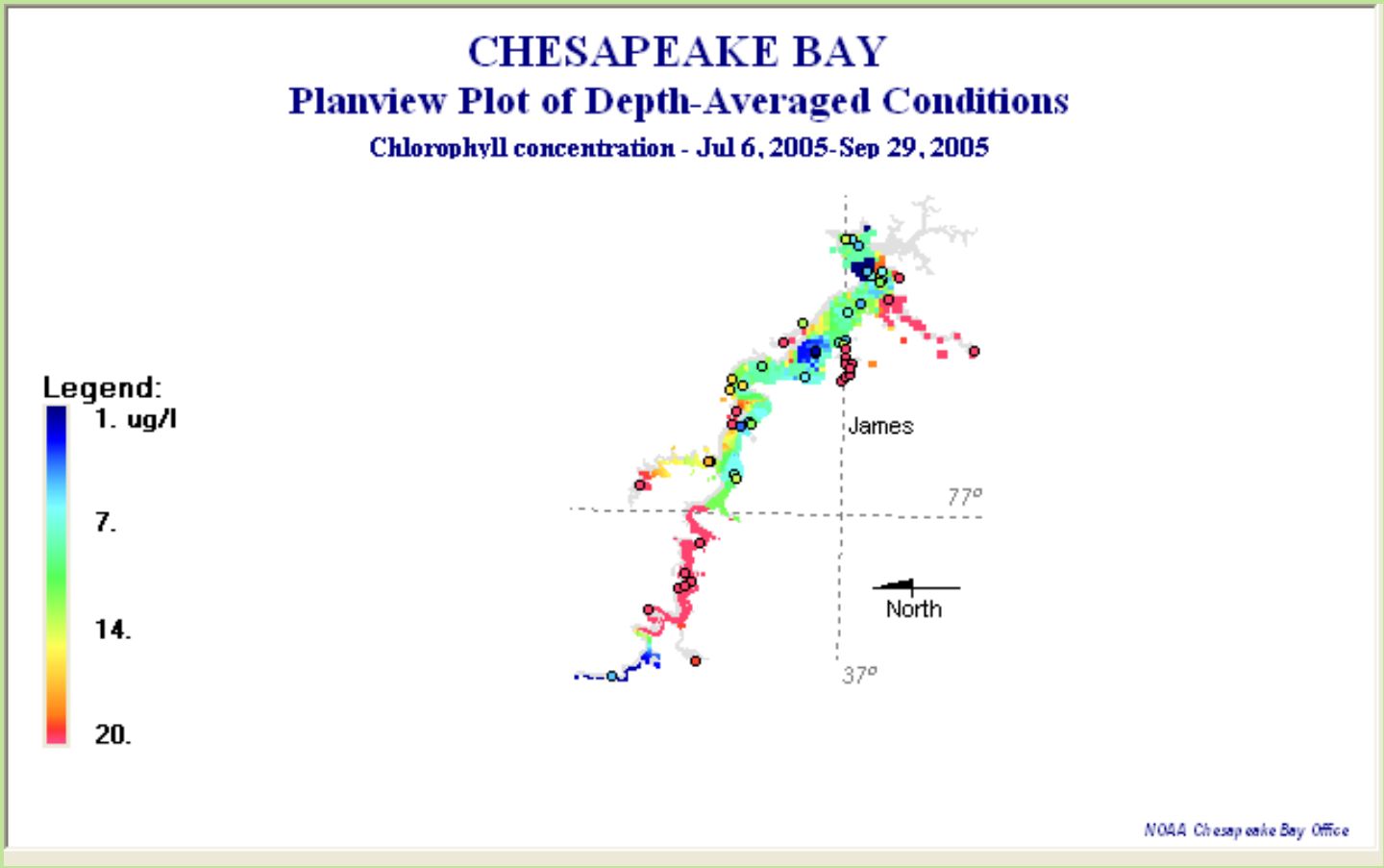


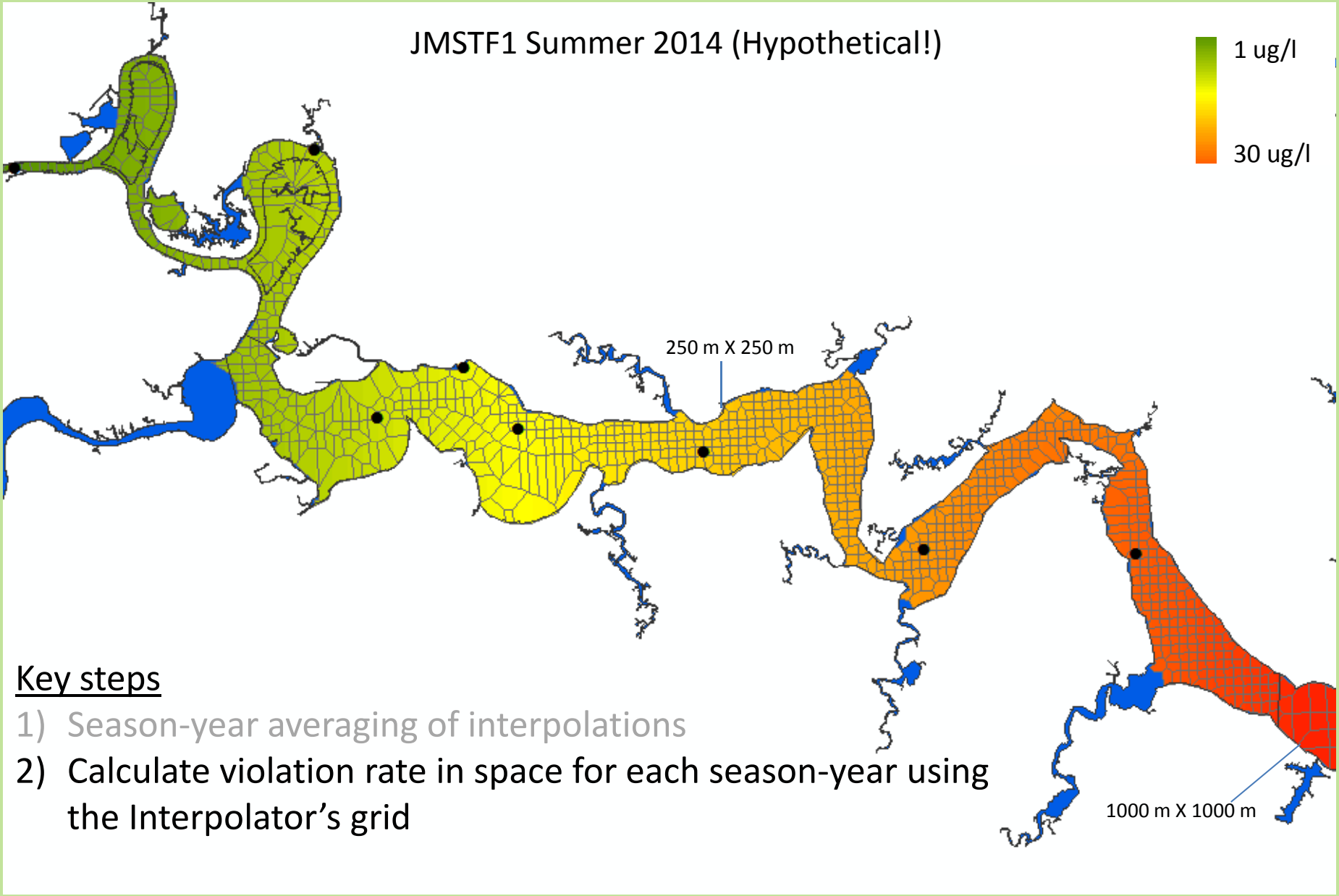
Key steps

1) Season-year averaging of interpolations


July
August
September
average
Summer 2014
average
Summer 2015
average
Summer 2016
Interpolation is done using the Chesapeake Bay Interpolator (IDW)

Screenshot of the graphical output of the Chesapeake Bay Interpolator

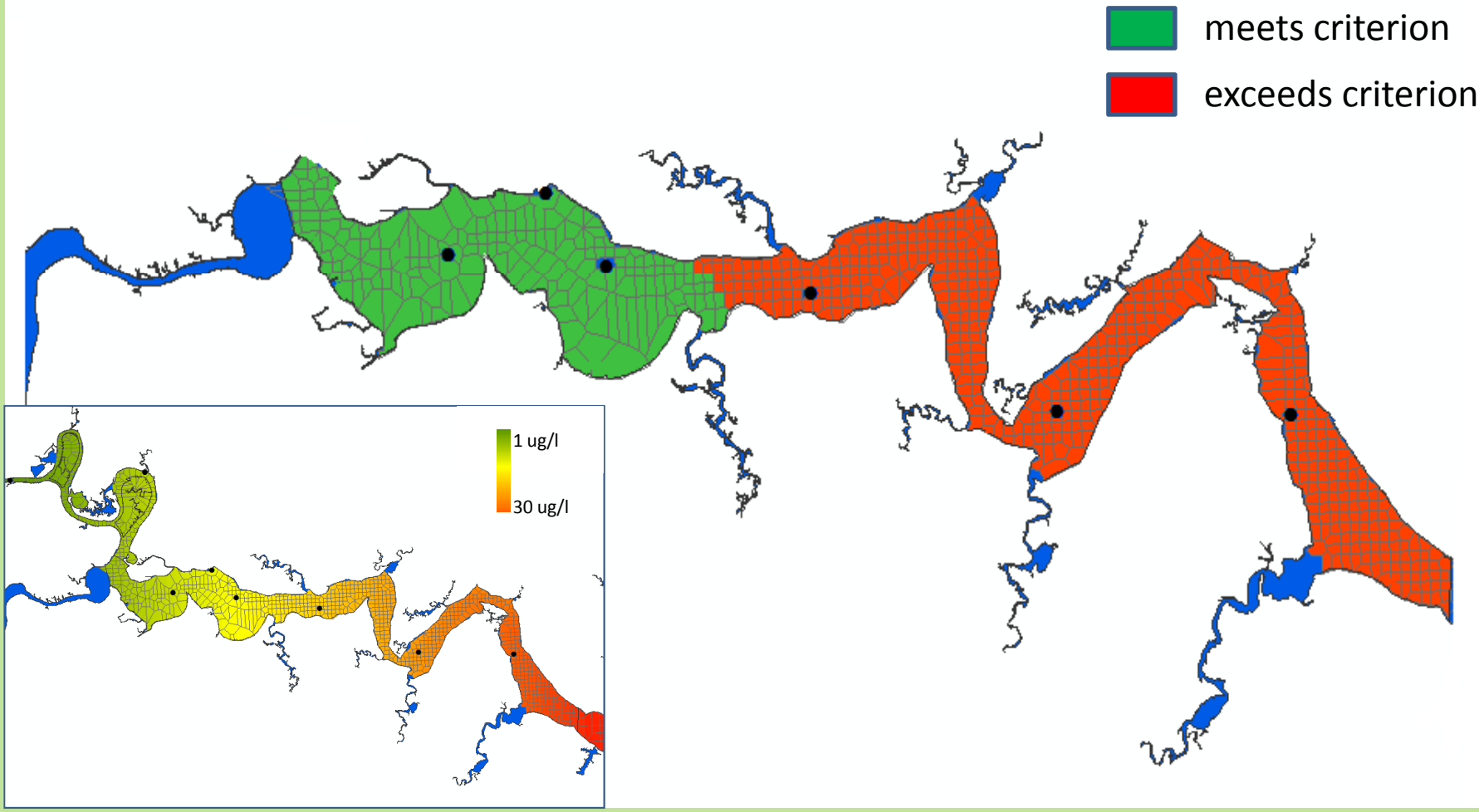




Key steps

1) Season-year averaging of interpolations
2) Calculate violation rate in space for each season-year using the Interpolator's grid

JMSTF1 Summer 2014 (Hypothetical “exceedence”layer)



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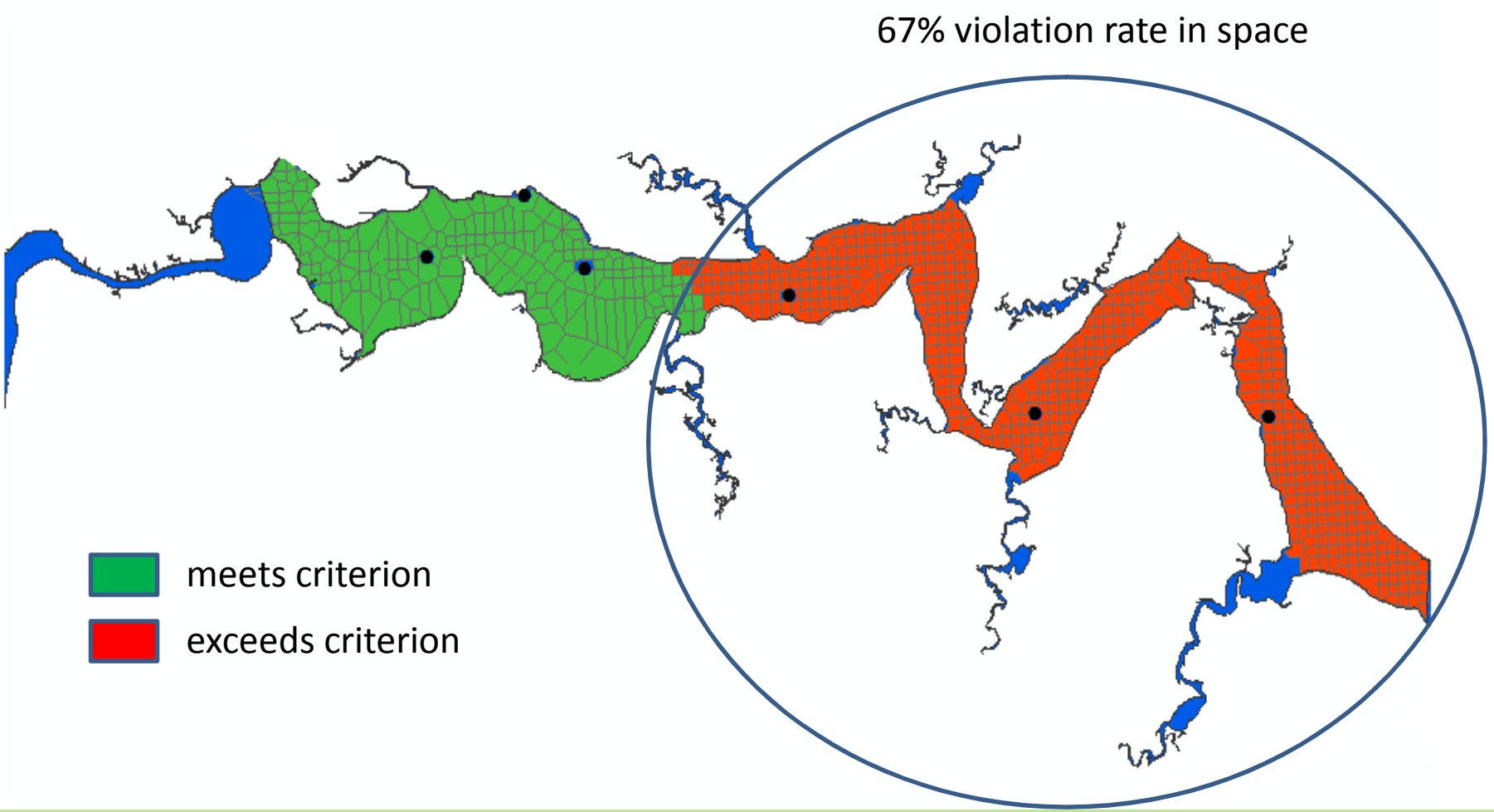


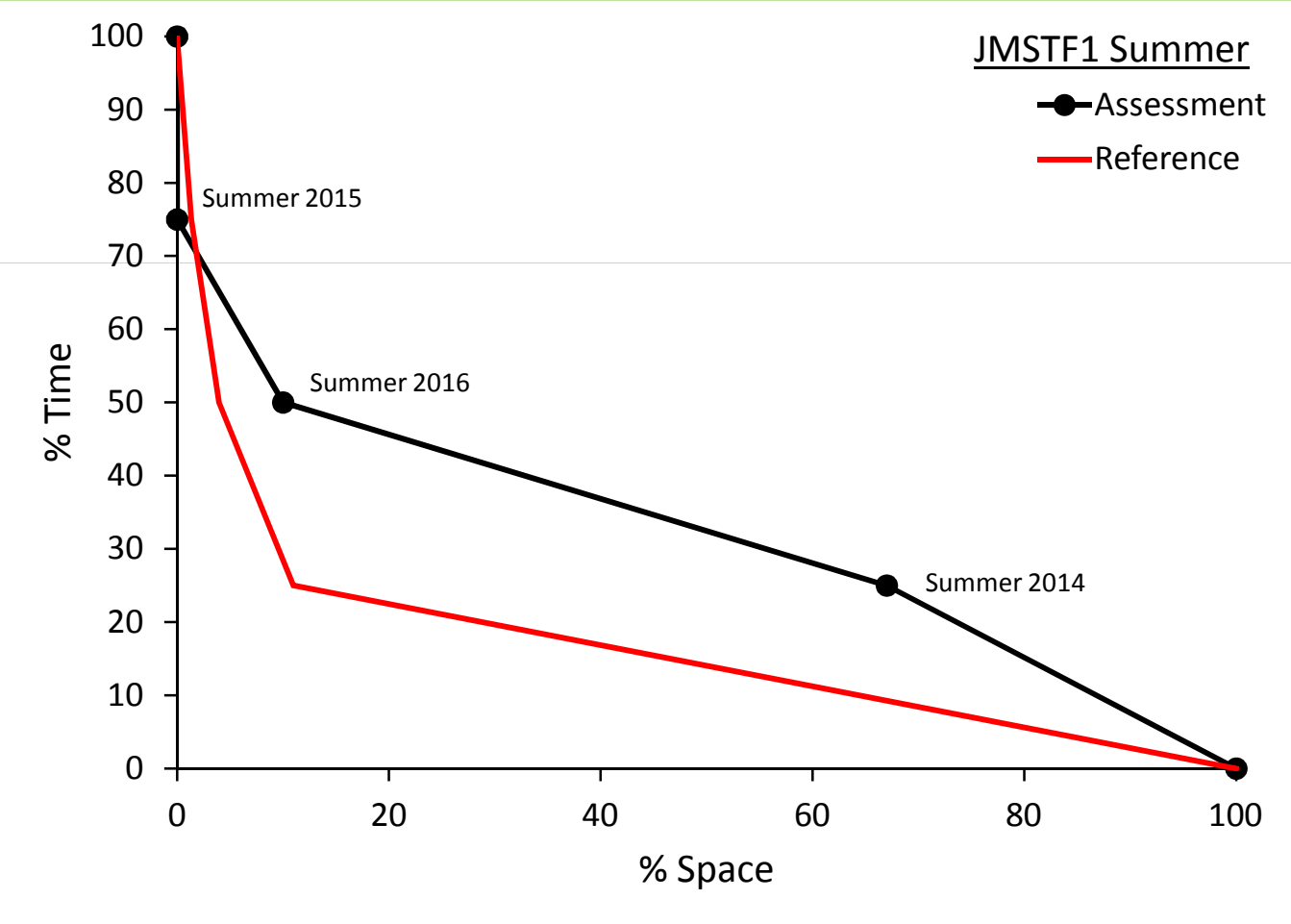
Key steps

1) Season-year averaging of interpolations
2) Calculate violation rate in space for each season-year
3) Determine the cumulative probability (Weibull formula)

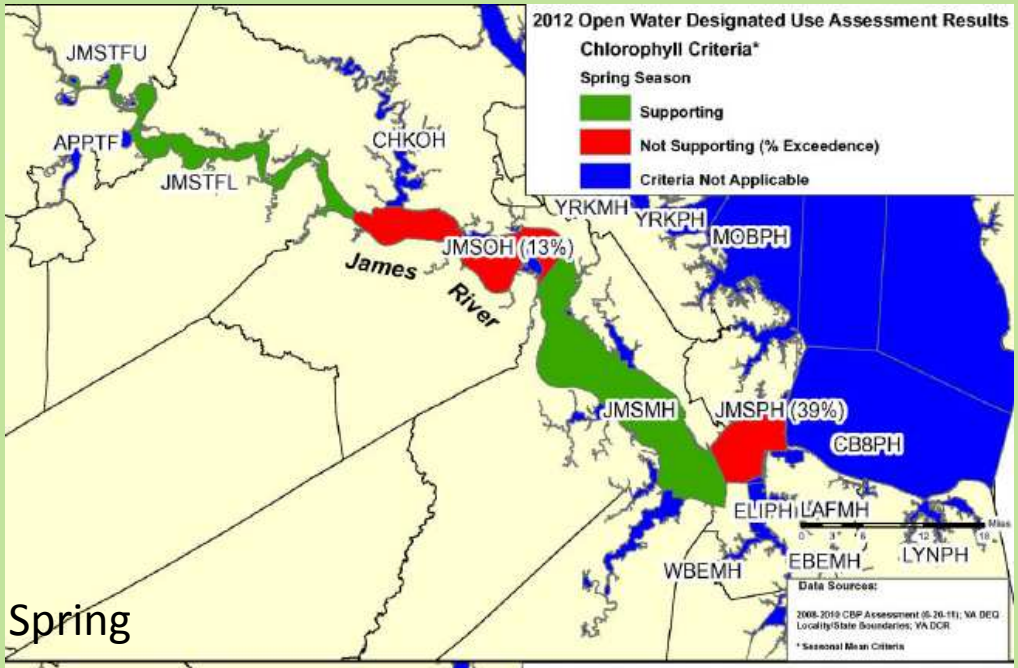
Season-Year JMSTF1	Space Violation Rate (Hypothetical)	Rank	Cumulative Probability Rank/(n+1)
Summer 2014	67%	1	25%
Summer 2016	10%	2	50%
Summer 2015	0%	3	75%

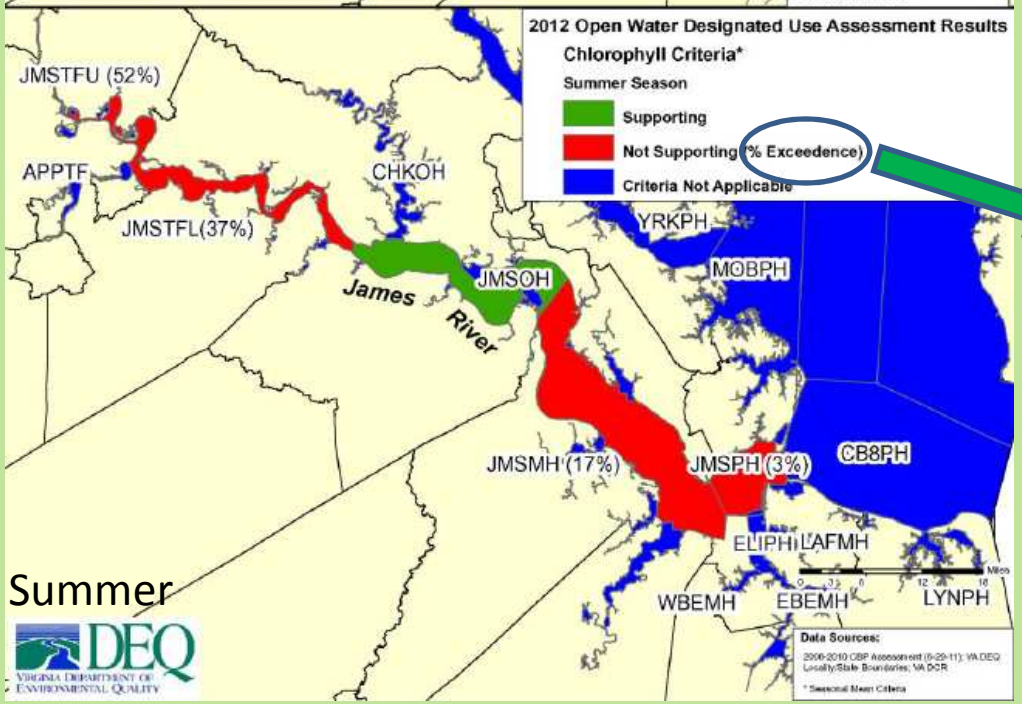
Key steps

1) Season-year averaging of interpolations
2) Calculate violation rate in space for each season-year
3) Determine the cumulative probability (Weibull)
4) Construct a Cumulative Frequency Diagram (CFD)

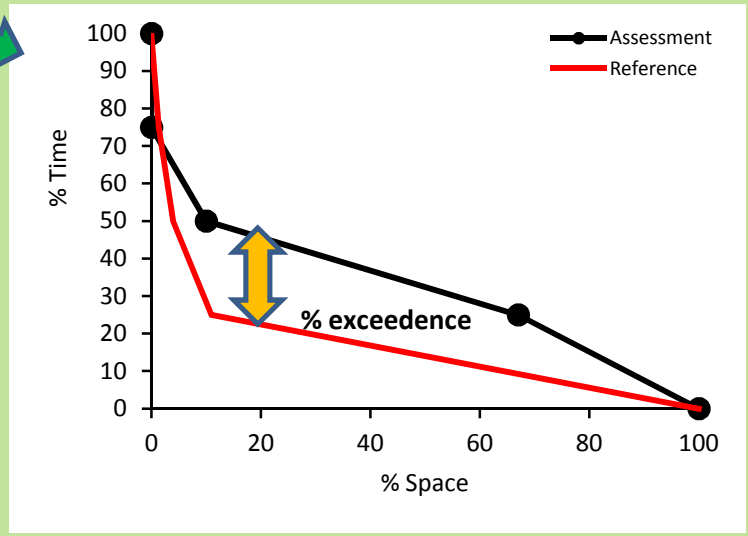


If the assessment curve crosses the reference curve at any point, the segment is deemed “impaired”.





This is how the results are presented in the Integrated Report

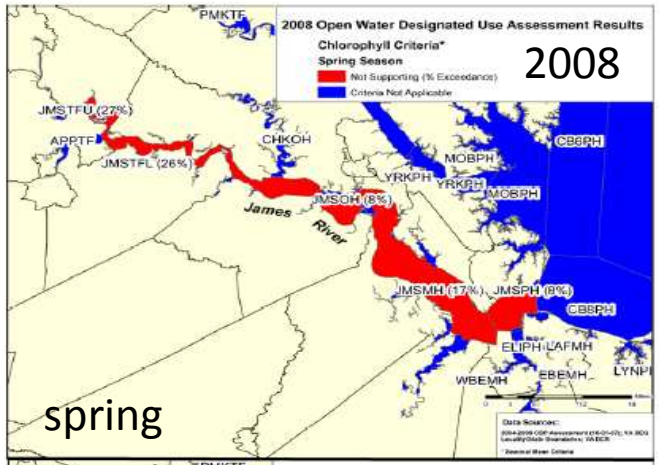


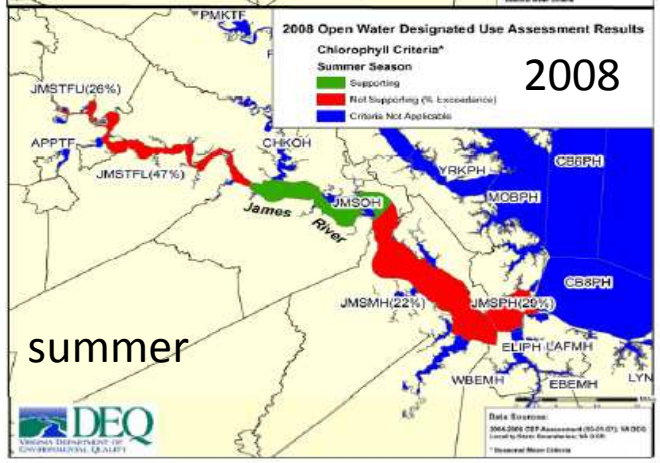
DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

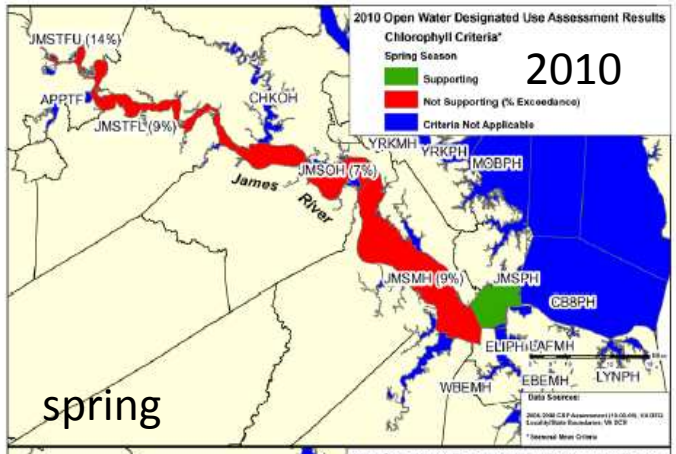
2012 Impaired Waters (Category 4A) TMDL Approved and (Category 4B) Other Control Measures Present*

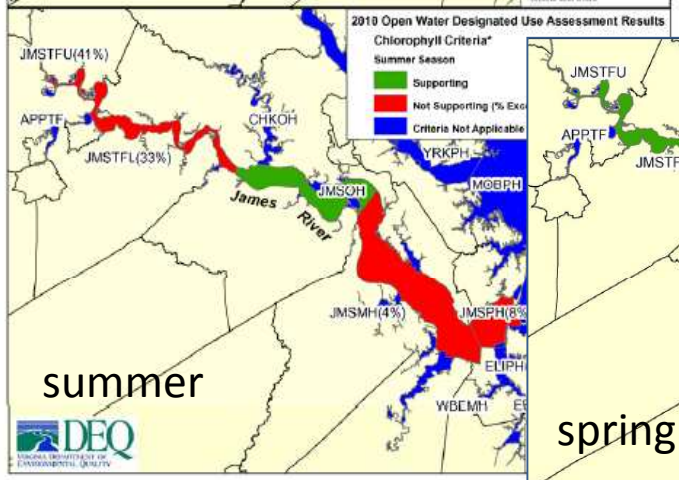
James River Basin

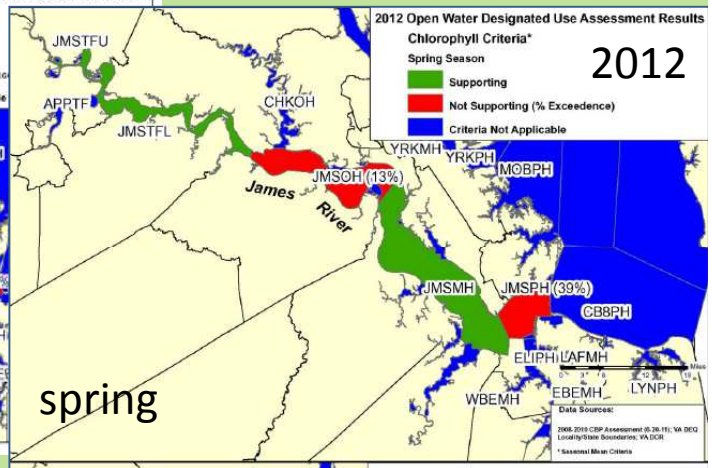
Cause Group Code / Impaired Use	Water Name / Cause	Cause Category	Estuary (Sq. Miles)	Reservoir (Acres)	River (Miles)	Initial List Date	TMDL Dev. Date
APPTF-SAV-BAY	Appomattox River						
Aquatic Life	Aquatic Plants (Macrophytes)	4A	2.705			2006	2010
Shallow-Water Submerged Aquatic Vegetation	Aquatic Plants (Macrophytes)	4A	2.705			2006	2010
EBEMH-DO-BAY	Eastern Branch, Elizabeth River and Indian River						
Aquatic Life	Oxygen, Dissolved	4A	2.287			2006	2010
Open-Water Aquatic Life	Oxygen, Dissolved	4A	2.287			2006	2010
ELIPH-DO-BAY	Chesapeake Bay segment ELIPH (Elizabeth River Mainstem)						
Aquatic Life	Oxygen, Dissolved	4A	8.162			2006	2010
Open-Water Aquatic Life	Oxygen, Dissolved	4A	8.162			2006	2010
G01E-01-BAC	James River						
Recreation	Escherichia coli	4A	1.466			1996	2010
	Escherichia coli	4A	4.605			2006	2010
	Escherichia coli	4A	0.075			2008	2010
G01E-02-CHLA	James River						
Aquatic Life	Chlorophyll-a	4A	5.512			2008	2010
Open-Water Aquatic Life	Chlorophyll-a	4A	5.512			2008	2010
G01L-01-BAC	Falling Creek Reservoir						
Recreation	Escherichia coli	4A		88.37		2008	2020
G01R-01-BAC	Goode Creek						
Recreation	Escherichia coli	4A			1.25	2006	2014
JMSPH-DO-BAY	James River CBP segment JMSPH and Tidal Tributaries						
Aquatic Life	Oxygen, Dissolved	4A	0.547			2006	2010
Open-Water Aquatic Life	Oxygen, Dissolved	4A	0.547			2006	2010
JMSTFL-DO-BAY	James River Tidal Freshwater (Lower) Estuary						
Aquatic Life	Oxygen, Dissolved	4A	0.123			1994	2010
	Oxygen, Dissolved	4A	28.981			2006	2010
	Oxygen, Dissolved	4A	0.049			2008	2010
Open-Water Aquatic Life	Oxygen, Dissolved	4A	0.123			1994	2010
	Oxygen, Dissolved	4A	28.981			2006	2010
	Oxygen, Dissolved	4A	0.049			2008	2010
JMSTFL-SAV-BAY	James River Tidal Freshwater (Lower) Estuary						
Aquatic Life	Aquatic Plants (Macrophytes)	4A	29.103			2006	2010
	Aquatic Plants (Macrophytes)	4A	0.049			2008	2010
Shallow-Water Submerged Aquatic Vegetation	Aquatic Plants (Macrophytes)	4A	29.103			2006	2010
	Aquatic Plants (Macrophytes)	4A	0.049			2008	2010

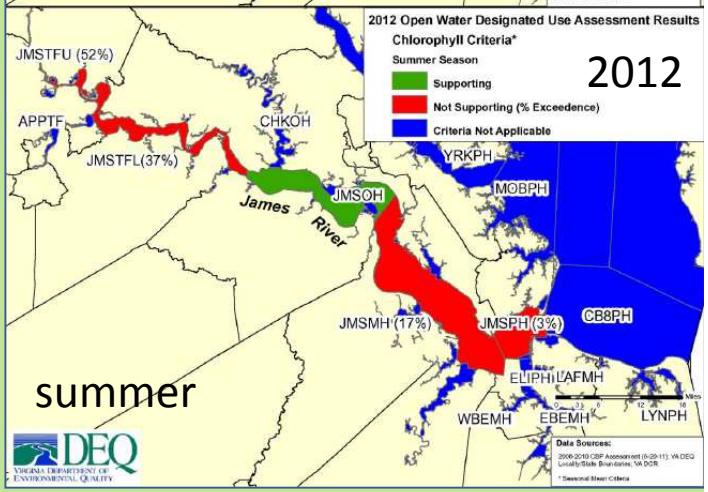












With the exception of JMSOH, the segments have had rather inconsistent seasonal attainments since we started assessing in 2008.